Cost of Generation Workshop: Assessing Solar Technology

Richard McCann

Aspen Environmental Group

March 7, 2013

Combining Solar Technology Data

- Using Itron and Navigant provides breadth of available estimates, using different methods
  - 2007 and 2009 COG criticized for being too narrow
- Mid cases typically close to each other
- Selected bounding cases to capture full range while being consistent

Aspen Environmental Group

Findings

- Tracking PV appears ready to overtake Fixed PV, but Fixed PV has more potential upside
- Solar Thermal with extended storage up to 11 hours could be fully cost-effective by end of the decade
- For 20 MW Solar, interconnection costs could be half of total costs by 2030

Aspen Environmental Group

Summary of Solar Factors Mid Case

Technology - Plant Costs Start Year = 2013 (2013 Dollars)	Gross Capacity (MW)	Instant Costs ($/kW)	Fixed O&M ($/kW-Yr)	Variable O&M ($/MWh)	Plant Side Losses	Capacity Factor	Degradation (%/Year) Capacity
Solar Parabolic Trough W/O	250	3,782	70.95	0.00	10.7%	26.5%	0.50%
Solar Parabolic Trough With	250	5,428	70.95	0.00	10.7%	43.0%	0.50%
Solar Power Tower W/O	100	4,130	62.81	0.00	12.0%	31.0%	0.50%
Solar Power Tower With	100	5,796	66.25	0.00	12.0%	40.0%	0.50%
Solar Power Tower With Storage 100 MW 11 HRs	100	6,450	66.25	0.00	12.5%	56.0%	0.50%
Solar Photovoltaic (Thin Film)	100	2,774	28.55	0.00	13.5%	21.7%	0.95%
Solar Photovoltaic (Single Axis)	100	2,754	37.00	0.00	13.5%	26.6%	0.55%
Solar Photovoltaic (Thin Film)	20	3,441	28.55	0.00	13.5%	21.7%	0.95%
Solar Photovoltaic (Single Axis)	20	3,457	37.00	0.00	13.5%	26.6%	0.55%

Aspen Environmental Group

Summary of Solar Factors High Case

Technology - Plant Costs Start Year = 2013 (2013 Dollars)	Gross Capacity (MW)	Instant Costs ($/kW)	Fixed O&M ($/kW-Yr)	Variable O&M ($/MWh)	Plant Side Losses	Capacity Factor	Degradation (%/Year) Capacity
Solar Parabolic Trough W/O	250	4,686	98.33	10.57	15.0%	20.0%	1.40%
Solar Parabolic Trough With	250	8,055	148.02	10.57	15.0%	41.0%	1.40%
Solar Power Tower W/O	100	5,236	91.98	0.00	13.0%	30.0%	1.40%
Solar Power Tower With	100	6,945	148.02	10.57	13.0%	36.0%	1.40%
Solar Power Tower With Storage 100 MW 11 HRs	100	7,257	148.02	10.57	13.0%	52.3%	1.40%
Solar Photovoltaic (Thin Film)	100	2,988	52.86	0.00	21.0%	18.5%	1.60%
Solar Photovoltaic (Single Axis)	100	3,694	52.86	0.00	21.0%	24.0%	1.25%
Solar Photovoltaic (Thin Film)	20	4,033	52.86	0.00	21.0%	18.5%	1.60%
Solar Photovoltaic (Single Axis)	20	4,946	52.86	0.00	21.0%	24.0%	1.25%

Aspen Environmental Group

Summary of Solar Factors Low Case

Technology - Plant Costs Start Year = 2013 (2013 Dollars)	Gross Capacity (MW)	Instant Costs ($/kW)	Fixed O&M ($/kW-Yr)	Variable O&M ($/MWh)	Plant Side Losses	Capacity Factor	Degradation (%/Year) Capacity
Solar Parabolic Trough W/O Storage 250 MW	250	3,002	47.58	0.00	9.0%	29.0%	0.25%
Solar Parabolic Trough With	250	5,052	47.58	0.00	9.0%	45.0%	0.25%
Solar Power Tower W/O	100	3,553	68.72	0.00	7.0%	32.0%	0.25%
Solar Power Tower With	100	5,051	47.58	0.00	10.0%	48.2%	0.25%
Solar Power Tower With Storage 100 MW 11 HRs	100	5,964	47.58	0.00	10.0%	62.0%	0.25%
Solar Photovoltaic (Thin Film)	100	1,852	17.97	0.00	11.0%	25.3%	0.25%
Solar Photovoltaic (Single Axis)	100	2,410	21.15	0.00	11.0%	31.5%	0.25%
Solar Photovoltaic (Thin Film)	20	2,185	17.97	0.00	11.0%	25.3%	0.25%
Solar Photovoltaic (Single Axis)	20	2,960	21.15	0.00	11.0%	31.5%	0.25%

Aspen Environmental Group